

CLAIMS

What is claimed is:

1 Sub
a5 1. A fiber optic module for transmitting and/or
2 receiving data, the fiber optic module comprising:
3 a printed circuit board, the printed circuit board having
4 high frequency electrical components mounted to a first
5 surface and a first ground plane formed on the first surface
6 near a first edge;
7 a plurality of fiber optic receptacles, the plurality of
8 fiber optic receptacles coupled to the printed circuit board
9 in parallel; and
10 an electromagnetic interference shield, the electro -
11 magnetic interference shield coupled to the ground plane of
12 the printed circuit board such that it covers the high
13 frequency electrical components mounted to the surface and
14 forms a first guide rail near the first edge.

15 2. The fiber optic module of claim 1, wherein,
2 the first guide rail is formed to slideably couple to a
3 first guide rail slot of a module cage.

1 3. The fiber optic module of claim 1, further
2 comprising:

3 an optical block, the optical block having a plurality of
4 lenses, each of the plurality of lenses for coupling photons
5 between a plurality of fiber optic cables coupled to the
6 plurality of fiber optic receptacle receptacles and the fiber
7 optic module.

1 4. The fiber optic module of claim 3 wherein,
2 the optical block has a plurality of optical ports each
3 having a fiber ferule inserted therein for aligning the fiber
4 optic cables to the plurality of lenses of the optical block.

1 5. The fiber optic module of claim 3 wherein,
2 the optical block has a plurality of openings, each of
3 the plurality of openings facing each of the respective
4 plurality of lenses on a second side, each of the plurality
5 of openings having sufficient size to accept a transmitter or
6 a receiver.

1 6. The fiber optic module of claim 5, further
2 comprising:
3 a plurality of transmitters coupled into the plurality of
4 openings in the optical block, each of the plurality of
5 transmitters including a vertical cavity surface emitting
6 laser.

1 7. The fiber optic module of claim 5 further comprising:
2 a plurality of receivers coupled into the plurality of
3 openings in the optical block, each of the plurality of
4 receivers including a photodiode, and a trans-impedance
5 amplifier.

1 8. The fiber optic module of claim 5 further comprising:
2 a plurality of transmitters and receivers coupled into
3 the plurality of openings in the optical block, each of the
4 plurality of transmitters including a vertical cavity surface
5 emitting laser and receivers including a photodiode.

6 9. The fiber optic module of claim 1 wherein,
1 the electromagnetic interference shield couples to the
2 ground plane of the printed circuit board such that it covers
3 the high frequency electrical components mounted to the first
4 surface and forms a second guide rail near a second edge of
5 the printed circuit board.

1 10. The fiber optic module of claim 9 wherein,
2 the electromagnetic interference shield sandwiches the
3 printed circuit board and the first and second guide rail
4 extend outside the electromagnetic interference shield on
5 opposite sides of the fiber optic module.

1 11. The fiber optic module of claim 1 further comprising:
2 a processor to control the transmitting/receiving of data
3 through at least one of the plurality of fiber optic
4 receptacles.

1 12. The fiber optic module of claim 1, further
2 comprising:

3 the plurality of fiber optic receptacles being four fiber
4 optic receptacles; and,

5 the printed circuit board having a hot-pluggable
6 connector to couple an electrical signal between the printed
7 circuit board and an electrical device located off of the
8 printed circuit board.

1 13. The fiber optic module of Claim 12 wherein the fiber
2 optic receptacles are LC receptacles.

1 14. The fiber optic module of Claim 12 wherein the fiber
2 optic receptacles are MT - RJ receptacles.

1 15. The fiber optic module of claim 1, wherein the
2 printed circuit board has an electrical component to convert
3 signals between an electrical form and an optical form.

1 16. The fiber optic module of claim 1, wherein the
2 printed circuit board has surface mount electrical
3 components.

1 17. The fiber optic module of claim 1, wherein the
2 printed circuit board has through-hole electrical components.

1 18. The fiber optic module of claim 1, wherein
2 said printed circuit board includes pins outside of said
3 electromagnetic interference shield, said pins being adapted
4 to being soldered to a printed circuit board external to said
5 fiber optic module.

1 19. A fiber optic system for transmitting and/or
2 receiving data, comprising:
3 a fiber optic module, the fiber optic module having one
4 or more guide rails electrically coupled to a ground plane of
5 a printed circuit board and electrically coupled to an
6 electromagnetic shield surrounding high frequency electrical
7 components mounted to the printed circuit board, the fiber
8 optic module further having a plurality of fiber optic
9 receptacles at one end and one or more electrical connectors
10 having connectors coupled to signal traces at an opposite end;
11 and,

12 a module cage to couple to the fiber optic module, the
13 module cage having a housing with an open end to accept the
14 fiber optic module and one or more guide slots on sides of an
15 interior surface, the one or more guide slots to slideably and
16 electrically couple to the one or more guide rails of the
17 fiber optic module.

1 20. The fiber optic system of claim 19, further
2 comprising:

3 a host printed circuit board to couple to the module cage
4 and the fiber optic module, the host printed circuit board
5 including

6 a ground plane to electrically couple to the one or
7 more guide rail slots of the module cage, and
8 one or more connectors to couple to the one or more
9 electrical connectors of the fiber optic module and their
10 respective pins.

1 21. The fiber optic system of claim 19, further
2 comprising:

3 a lock mechanism, the lock mechanism having
4 a rocker arm with a hook to couple to a guide rail
5 of the fiber optic module to lock it in place, and
6 a cam to couple to a cutout of a sliding arm and
7 decouple the hook of the rocker arm from the guide rail

8 of the fiber optic module.

1 22. The fiber optic system of claim 19, further
2 comprising:

3 an ejection mechanism, the ejection mechanism having
4 a lever arm with a cradle at a pivoting end, the
5 cradle to couple to an end of the printed circuit board
6 of the fiber optic module to push out and eject the fiber
7 optic module, an opposite end of the lever arm coupled to
8 the sliding arm to cause the lever arm to pivot about the
9 pivoting end and eject the fiber optic module when the
10 sliding arm is pushed in by a user to unlock and eject
11 the fiber optic module.

1 23. The fiber optic system of claim 19 wherein,
2 the module cage further has one or more tabs to
3 electrically couple the one or more guide slots to the ground
4 plane of the host chassis ground.

1 24. The fiber optic system of claim 19 wherein,
2 each of the one or more guide slots of the module cage
3 has a flared opening to more easily accept the one or more
4 guide rails of the fiber optic module.

1 25. The fiber optic system of claim 19 wherein,

2 the module cage is formed of a conductive material to
3 provide another electromagnetic shield.

1 26. The fiber optic system of claim 19 wherein,
2 the fiber optic module is a fiber optic transmitter and
3 the fiber optic transmitter has a processor to separately
4 monitor the output optical power and adjust the transmitter of
5 each communication channel in response to the measured output
6 optical power in each respectively.

1 27. The fiber optic system of claim 19 wherein,
2 said fiber optic module and said module cage is a GBIC
3 package.

1 28. The fiber optic system of claim 27 wherein,
2 said fiber optic receptacles are LC receptacles.

1 29. A method of shunting electromagnetic radiation from
2 high frequency electrical components of a fiber optic module
3 to ground , the method comprising:
4 providing a printed circuit board;
5 mounting high frequency electrical components in a common
6 area on a surface of the printed circuit board;
7 providing an electromagnetic shield to surround the

8 common area where the high frequency electrical components are
9 mounted to the printed circuit board; and
10 forming one or more guide rail slots in the printed
11 circuit board by coupling the electromagnetic shield to the
12 printed circuit board, the one or more guide rail slots
13 electrically coupled to a ground plane of the printed circuit
14 board and electrically coupled to the electromagnetic shield.

1 30. The method of claim 29 further comprising:

2 sliding the fiber optic module into a module cage coupled
3 to a ground plane of a host printed circuit board, the one or
4 more guide rails of the fiber optic module to slideably and
5 electrically couple to one or more guide rail slots of the
6 module cage.

1 31. A fiber optic system for transmitting and/or
2 receiving data, comprising:

3 a fiber optic module having four channels for parallel
4 optical transmitting and/or receiving of data;
5 a module cage complying with a standard SC duplex Gigabit
6 Interface Card package for receiving said fiber optic module;
7 and,

8 four optical receptacles that fit into a standard SC
9 duplex Gigabit Interface Card (GBIC) package

10 an electrical component confined within said package on a
11 printed circuit board to allow hot-plugging into said cage

1 32. The fiber optic system of claim 31, wherein the four
2 fiber optical receptacles are LC receptacles.

1 33. The fiber optic system of claim 31, wherein the four
2 fiber optical receptacles are MT - RJ receptacles.

3 34. A fiber optic system for transmitting and/or
4 receiving data, comprising:

5 a fiber optic module, the fiber optic module having four
6 channels for parallel optical transmitting and/or receiving of
7 data;

8 four optical receptacles that fit into a standard SC
9 duplex package

10 an electrical component associated with said fiber optic
11 module confined within a standard SC duplex package and on a
12 printed circuit board; and

13 a fixed pin-type electric connector to allow said fiber
14 optic module to be soldered onto a host printed circuit board.

15 35. The fiber optic system of claim 34, wherein the four
16 fiber optical receptacles are LC receptacles.

17 36. The fiber optic system of claim 34, wherein the four

2 fiber optical receptacles ~~are~~ MT - RJ receptacles.

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